

Nonlinear dynamics of extended cavity Ti:sapphire modelocked oscillator

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We present the results of our studies on the stability of Ti:sapphire oscillator with low repetition rate. The oscillator repetition rate is reduced by extending its cavity with Herriot cell, which consists of a stable two-mirror resonator with beam injection and the extraction mechanism. Lowering of the repetition rate, while keeping oscillator output power constant, results in the increase of a pulse energy. We have found the areas of the laser stability as a function of two order parameters: intracavity dispersion and the pump power. It appears that for certain values of order parameters the laser output exhibits two types of instabilities. The first one is the automodulation, which is caused by the competition between the laser light intensity and the population inversion. The second one is related to the cavity geometry. Moreover we provide the theoretical four-level model describing the dynamics of the laser system, in which the multimode approach is considered.